RE 250 Variable Area Flowmeter

Operating instructions

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MECON
FLOW-CONTROL-SYSTEMS

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Contents

1 Safety instructions

1.1 Intended use

The series *RE250* of flowmeters with a standard length of 250 mm (9.84 inch) and a completely metal design is suitable for measuring different liquids and gases in closed piping.

The robust design enables the operation in rough conditions also. Different types of flanges, liners and float materials satisfy the requirements of the pharmaceutical and chemical Industries.

The devices are particularly suitable for the measurement of:

- Water
- Fluids
- Corrosion protection agents
- Lubricants
- Saturated and superheated steam
- Food and beverages
- Industrial gases

Warning!

Solely the operator of these measuring devices is responsible for suitability, intended use and corrosion resistance of the used materials. It must be particularly ensured that the materials selected for the wetted parts of the flowmeter are suitable for the used process media.

The manufacturer is not liable for any damage resulting from improper or unintended use of these devices.

No external loads may act upon the meter. The flowmeters are primarily designed for static applications.

Caution!

***Hot surfaces resulting from hot process media**.*

Danger of burns resulting from surface temperatures above 70 °C.

- *Take appropriate protective measures, for example contact protection.*
- *The design of the contact protection must ensure here that the maximum permissible ambient temperature of the meter is not exceeded.*

The flowmeter may only be operated within the pressure and voltage limits specified on the name plate.

Before replacing the flowmeters, check that the unit is free of hazardous media and pressures.

1.2 Certifications

CE marking

CE

The manufacturer certifies for the device RE 250 the fulfilment of all statutory requirements of the following EC directives by applying the CE marking:

- Pressure equipment directive 97/23/EC
- Low voltage directive 2006/95/EC *
- EMC-directive 2004/108/EC and 89/336/EWG *
- NAMUR recommendation NE21 *
- ATEX directive 94/9/EG **

(* Devices with electrical installations) (** Devices for use in hazardous areas)

1.3 Safety instructions from the manufacturer

1.3.1 Disclaimer

The manufacturer will not be liable for any damage using its product, including, but not limited to direct, indirect, incidental, punitive and consequential damages.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to revise the content of its documents, including this disclaimer, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.3.2 Product liability and warranty

Mecon GmbH can assume no guarantee for repair work carried out by the customer without prior notification and consultation. In case of complaint, the rejected parts must be returned to us, if no other arrangement has been made.

1.3.3 General information

This manual is intended for correct installation as well as operation and maintenance of the devices. Read the instructions carefully before installing the device and put it into operation.

Specially designed or customised models and specialised applications are not included in this manual.

1.4 Safety instructions for the operator

Warning!

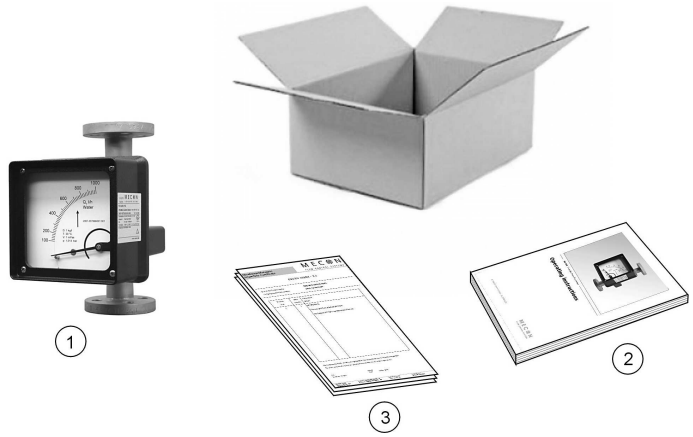
***Hot surfaces resulting from hot process media**.*

Danger of burns resulting from surface temperatures above 70 °C.

- *Take appropriate protective measures, for example contact protection.*
- *The design of the contact protection must ensure here that the maximum permissible ambient temperature of the meter is not exceeded.*

2 Device description

2.1 Scope of delivery



1 Flowmeter RE250

2 Operating Instructions

3 Certificates

Fig xx Scope of delivery

Information!
Please check the delivery for completeness using the packing list.

2.2 Device versions

2.2.1 Display unit made of aluminium

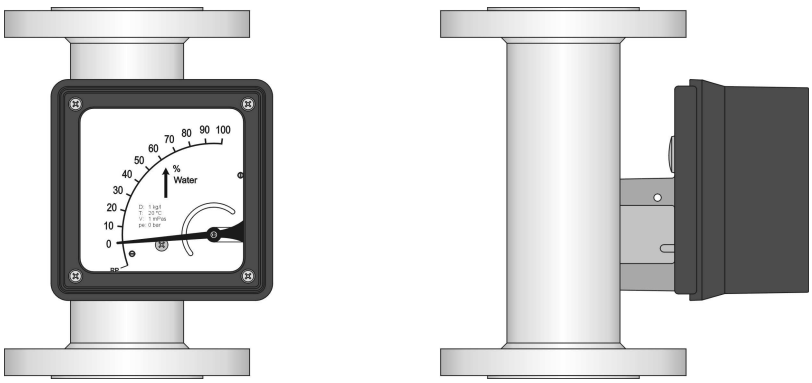


Fig. xx Standard device with display unit made of aluminium

The measured value is indicated directly on the scale. The equipment can be supplied with accessory electrical components and touch-sensitive switches for process monitoring and control.

2.2.2 Display unit made of stainless steel

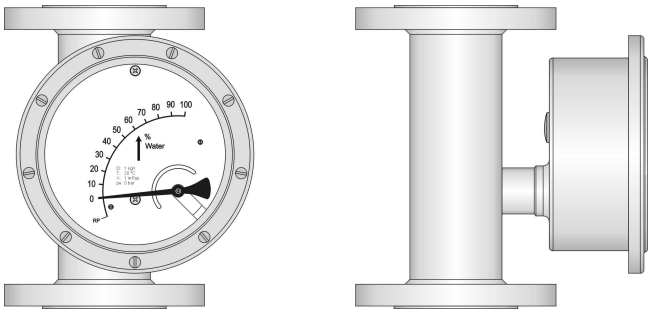


Fig. xx Standard device with display unit made of stainless steel

For applications with the requirements of higher protection category or corrosion resistance the devices are available with a display unit made of stainless steel.

2.2.3 Heating sheath

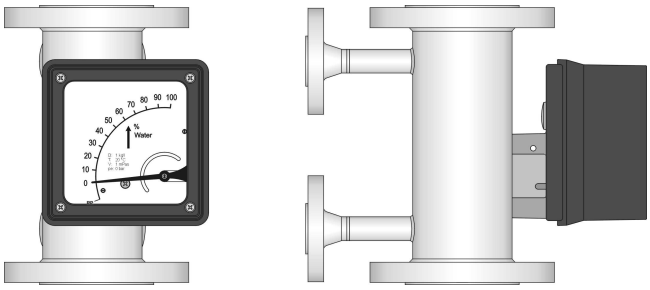


Fig. xx Device with heating sheath

For measuring points where a temperature drop is unacceptable the devices are available with an external heating sheath.

2.2.4 Float damping

A float damping is recommended

- Generally for measuring gases
- Vibrations for the piping cannot be avoided

It is also strongly recommended in the case of

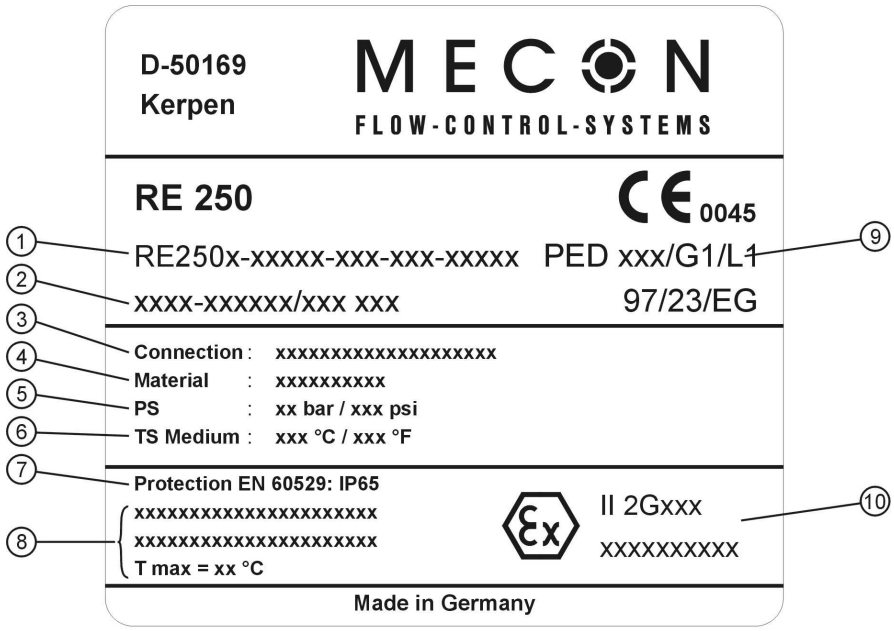
- applications where air bubbles in the medium cannot be avoided
- predominating shock pressure in the piping, e.g. due to rapid throttling or shut-off
- turbulences, pulsations, etc. which could lead to vibrations to the flowmeter
- rapid pressure build-up in the piping

2.3 Nameplate

Important!

Please refer to the device nameplate to ensure that the device is built according to your order.

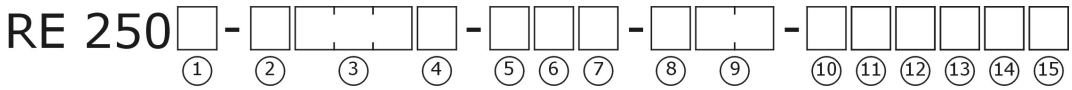
Check particularly for the correct supply voltage.



1	Code number	Device specific code number
2	Year / Serial number	Device specific serial number and the year it was built
3	Connection	Connection type of the device
4	Material	Material of the wetted parts
5	PS	Maximum pressure of the medium
6	TS Medium	Maximum temperature of the medium
7	Protection	Protection class for the housing of display
8	MEM specification	Electrical specifications of the output / transducer (MEM)
9	Category	Category acc. to Pressure Equipment directive (PED)
10	ATEX marking	Device specific ATEX marking / certification code acc. EN50014

2.4 Description code

The description code consists of the following elements:



① Flow tube

A	Nominal size flow tube DN 15
B	Nominal size flow tube DN 25
C	Nominal size flow tube DN 40
D	Nominal size flow tube DN 50
E	Nominal size flow tube DN 80
F	Nominal size flow tube DN 100

② Version

1	CF-S	wetted parts: stainless steel
2	EF-H	wetted parts: Hastelloy®
3	FF-P	wetted parts: PTFE

③ Process connections

Nominal size

	EN1092-1	ANSI B16.5	Flow tube EN						Flow tube ANSI					
			A	B	C	D	E	F	A	B	C	D	E	F
Axx	DN 15	½ ″	●	●					●	○				
Bxx	DN 20	¾ ″	●	●	○				●	●				
Cxx	DN 25	1 ″	●	●	●				●	●	○			
Dxx	DN 32	1 ¼ ″	●	●	●	○			●	●	●			
Exx	DN 40	1 ½ ″	●	●	●	○			●	●	●	○		
Fxx	DN 50	2 ″	●	●	●	●			●	●	●	●		
Gxx	DN 65	2 ½ ″	●	●	●	●	○		●	●	●	●	○	
Hxx	DN 80	3″	●	●	●	●	●	○	●	●	●	●	●	
Jxx	DN 100	4″	●	●	●	●	●	●	●	●	●	●	●	●
Kxx	DN 125	5″	●	●	●	●	●	●	●	●	●	●	●	●
Lxx	DN 150	6″	●	●	●	●	●	●	●	●	●	●	●	●

● = available ○ = reduced scale raised face

Pressure rating

x**B**x	PN 16 B1	(EN 1092-1)	DN65 - DN150
x**D**x	PN 40 B1	(EN 1092-1)	DN65 - DN150
x**E**x	PN 63 B2	(EN 1092-1)	DN65 - DN150
x**F**x	PN 100 B2	(EN 1092-1)	DN65 - DN150
x**H**x	150 lbs	(ASME B16.5)	½″ – 6″
x**J**x	300 lbs	(ASME B16.5)	½″ – 6″
x**K**x	600 lbs	(ASME B16.5)	½″ – 6″

Flange form

xx**A**	B1	(EN 1092-1)	PN16 / PN40
xx**B**	B2	(EN 1092-1)	PN63 / DN100
xx**C**	Form D	(EN 1092-1)	DN15 - DN150
xx**D**	Form C	(EN 1092-1)	DN15 - DN150
xx**G**	Form RF	(ASME B16.5)	½″ – 6″
xx**H**	Form FF	(ASME B16.5)	½″ – 6″
xx**J**	Form RTJ	(ASME B16.5)	½″ – ¾″ 150 lbs not available

(4) Heating sheath

0	without
1	With flange connection DN 15 DIN 2501 PN 40 in stainless steel
2	With flange connection DN 25 DIN 2501 PN 40 in stainless steel I
3	With flange connection ½" ANSI B16.5 150 RF in stainless steel
4	With flange connection 1" ANSI B16.5 150 RF in stainless steel

(5) Measuring ranges

	Fluids [l/h]	Gases [m³/h]	Flow tube					
			A	**B**	**C**	**D**	**E**	**F**
1	0,5 - 5	0,015 - 0,15	●	●				
2	1,0 - 10	0,030 - 0,30	●	●	○			
3	1,6 - 16	0,048 - 0,48	●	●	●			
4	2,5 - 25	0,075 - 0,75	●	●	●	○		
5	4,0 - 40	0,13 - 1,3	●	●	●	○		
A	5,0 - 50	0,15 - 1,5	●	●	●	●		
B	7,0 - 70	0,21 - 2,1	●	●	●	●	○	
C	10,0 - 100	0,30 - 3,0	●	●	●	●	●	○
D	16,0 - 160	0,46 - 4,6	●	●	●	●	●	●
E	25,0 - 250	0,70 - 7,0	●	●	●	●	●	●
F	40,0 - 400	1,1 - 11	●	●	●	●	●	●
G	60,0 - 600	1,7 - 17						
H	100 - 1000	3,0 - 30						
J	160 - 1600	4,6 - 46						
K	250 - 2500	7,0 - 70						
L	400 - 4000	11,0 - 110						
M	600 - 6000	17,0 - 170						
N	1.000 - 10.000	29,0 - 290						
P	1.600 - 16.000	46,0 - 460						
Q	2.000 - 20.000	55,0 - 550						
R	2.500 - 25.000	70,0 - 700						
S	4.000 - 40.000	110 - 1.100						
T	5.000 - 50.000	135 - 1.350						
U	6.000 - 60.000	170 - 1.700						
V	8.000 - 80.000	240 - 2.400						
W	10.000 - 100.000	300 - 3.000						

3 Installation

3.1 Notes on installation

Information!
All instruments are carefully checked for functional capability before distribution. On receipt of the device please carry out a visual inspection of the outer packing for damage or improper handling.

Please contact the carrier and your responsible sales field service if you should discover any defects. In such cases a description of the defect, the type and the serial number of the device is needed.

Information!
Unpack the equipment with care to prevent damage.

Information!
All instruments are carefully checked for order conformity.
Please check the delivery for completeness using the packing list. Please examine the flowmeter nameplate to verify that the device was built according to your order. Particularly check devices with electrical components for the correct supply voltage.

3.2 Storage

- Store the device in a dry and dust-free place.
- Keep away from direct sun and heat.
- Avoid external load to the device.
- The storage temperature range for standard devices with electrical components is about -40 … +80 °C / -40 … +176 °F.

3.3 Installation conditions

Below the essential points concerning installation are described and have to be observed:

- Remove the transport securing device from the fitting.
- Verify prior to installation that the float slides smoothly in the fitting without canting or deadlocking. The pointer must smoothly follow the float movement.
- Verify that accessories such as spring stop, gas/fluid damping are still correctly fixed in the fitting.

- In the zero position (no flow) the pointer must be at the marked reference point (first line on the scale). When moving the float manually to the end position, the pointer must be above the final value of the scale.
- The flowmeter must be installed vertically – flow direction from bottom to top. For installation recommendations refer to guideline VDI/VDE 3513 Part 3.
- The installation in the piping must be tension-free – therefore the piping must be positioned parallel and aligned to each other.
- Avoid a corrosive atmosphere –provide a ventilation where necessary.
- Ensure a sufficient distance of at least 200 mm to magnet-influencing parts like e.g. solenoid valves and ferromagnetic components e.g. steel brackets.
- Observe a lateral distance of at least 300 mm between two next to one another mounted devices. The distance can be reduced by mounting the devices staggered by the length of one device. In case of doubt the influence can be tested by moving the instrument up and down ca. 200 mm at a selected distance and check whether the position of the pointer in the display changes.
- Specify the installation zone regarding a reliable reading of the displayed values and adequate space for servicing.
- An inlet run upstream and an outlet run downstream the device is not necessary in the case of linear media flow profile. In the case of highly asymmetric flow profiles, however, additional measures (e.g. inlet tracks, flow rectifiers) with a length of at least 250 mm could be appropriate to ensure the measuring accuracy.
- Avoid the installation of unilaterally constricting fittings upstream of the device.
- Ensure that the piping has been mounted securely to avoid vibration or oscillation of the devices.
- The nominal width of the flowmeter and the connected piping must be identically.
- Use connectors suitable for the particular device version (dimension, pressure stage).
- Ensure that the clearance between the flanges of the piping corresponds to the device dimension additionally two gaskets.
- Before connecting the device, blow or flush out the pipes leding to the device.
- The surface roughness of the flange sealing areas must be appropriate for the used gaskets.
- The used gaskets and bolts of the prescribed dimensions must be appropriate for the operating pressure, the temperature and the media.
- **Do not use carbon steel mounting brackets for the device!**

Additionally for **devices with PTFE liner:**

- Use gaskets which are conform to the inner and outer dimensions with the raised face of the flowmeter.
- Tighten the screws crosswise to ensure the tightness of the process connections. For the tightening torques please refer to chapter "3.3.1 Tightening torques".

- If the instrument is absolutely calibrated for a pressure exceeding 1.013 bar the valve is usually installed at the rear of the flowmeter, at 1.013 bar absolute (free emanation) in front of the instrument.

Particularities for measuring gas flow:

- Valves have to be installed downstream of the device if p_{abs} >1.013 bar and upstream of the device if p_{abs} =1.013 bar (free outflow) usually.
- Install a throttle just downstream of the device to prevent compression oscillation during measurement.
- Ensure by means of design features that the operating pressure for the flowmeter corresponds to the reference pressure of the calibration to avoid erroneous measurements.

3.3.1 Tightening torques

The flange bolts for devices with PTFE liner may be tightened with the following torques (acc. guideline VDI/VDE 3513):

DN	ANSI	max. torque	
		Nm	ft*lbf
15	½"	14	10
20	¾"	14	10
25	1"	14	10
32	1 ¼"		
40	1 ½"		
50	2"	25	18
65	2 ½"		
80	3"	35	25
100	4"	42	30
125	5"		

Einschränkung bei 600 lbs??

3.3.2 Magnetic filters

To prevent a malfunction of the flowmeter caused by a medium which contains ferromagnetic substances such as weld beads a magnetic filter should be mounted in flow direction upstream of the measuring instrument.

This kind of filter is also recommended if such particles cannot be avoided in standard operation.

4 Electrical connections

4.1 Safety instructions

Warning!

All work on the electrical connections may only be carried out with the power disconnected.

It is essential to observe the voltage data on the nameplate.

Warning!

Observe all occupational safety regulations unconditionally.

Any work done on the electrical components of the device may only be carried out by a specialist.

4.2 Electrical connections

4.2.1 Limit switches

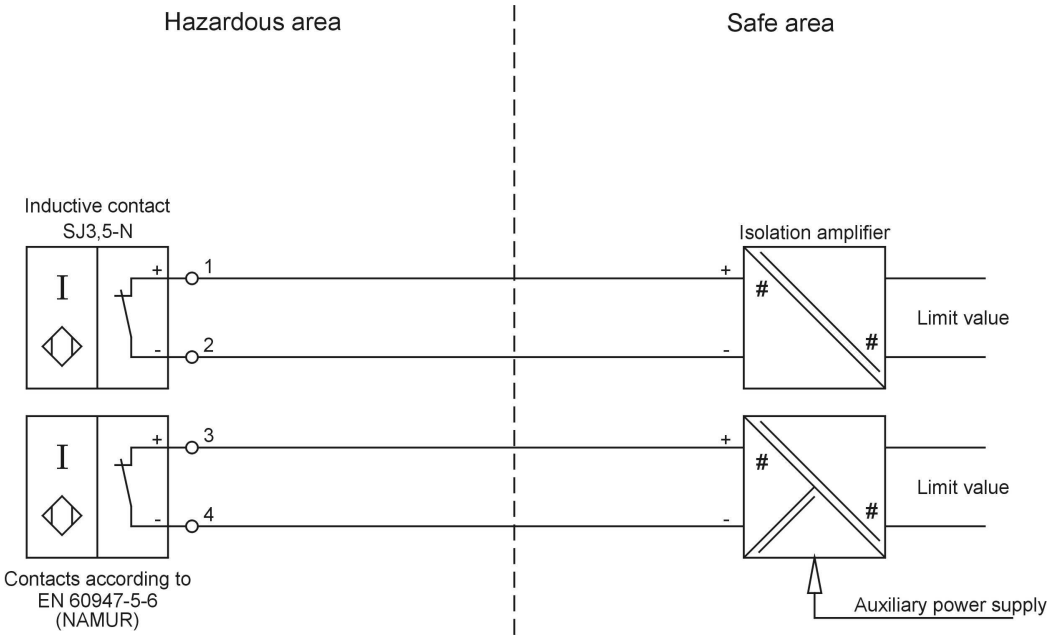


Fig xx Electrical connection – Limit switches

4.2.2 Current output (MEM)

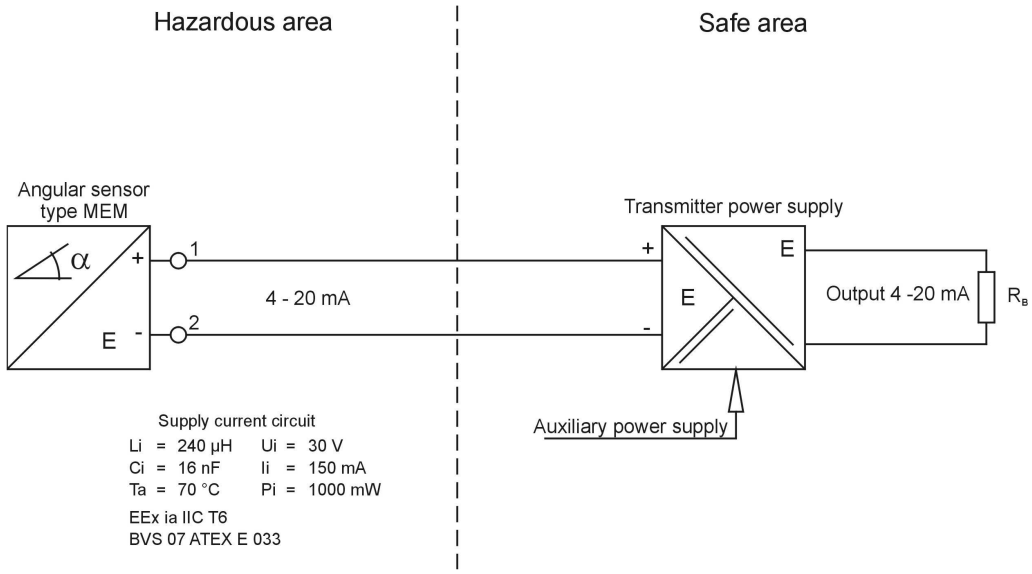


Fig x.x Connection diagram for transducer MEM with current output

4.2.3 Current output with HART (MEM)

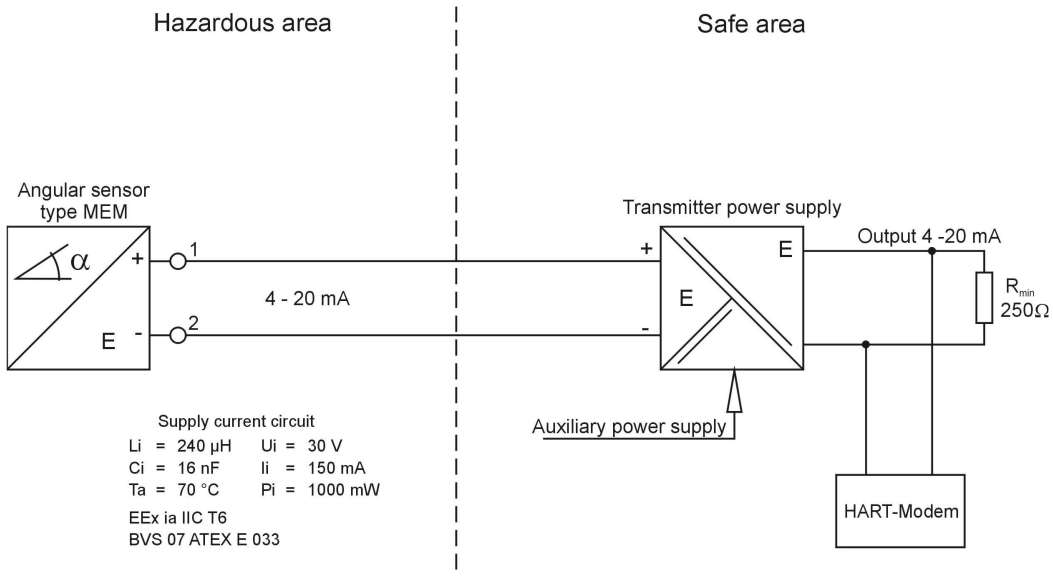


Fig x.x Connection diagram for transducer MEM with HART communication

4.2.4 Current output with HART and digital outputs (MEM)

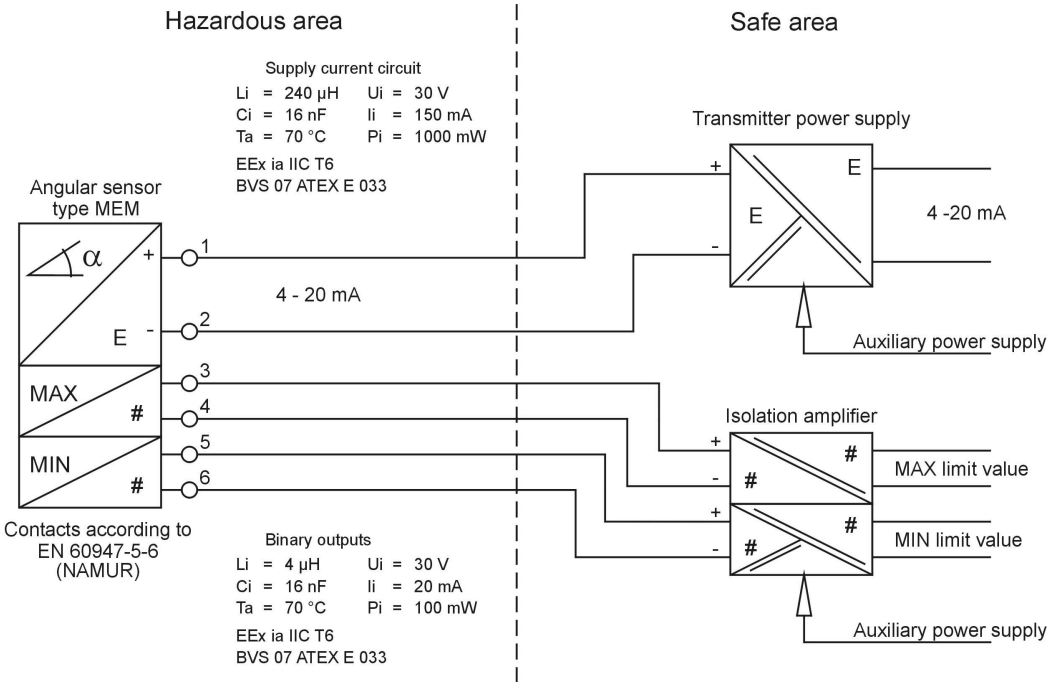


Fig x.x Connection diagram for transducer MEM with HART communication and 2 limit switches

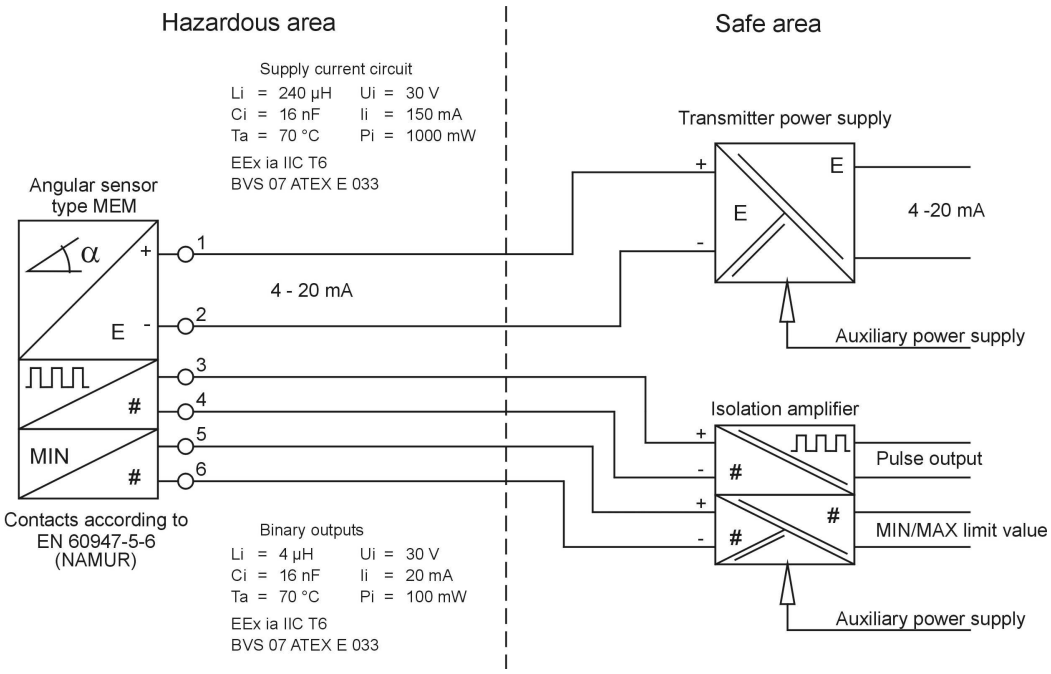


Fig x.x Connection diagram for transducer MEM with HART communication, limit switch and pulse output

4.2.5 PROFIBUS PA (MEM-PPA)

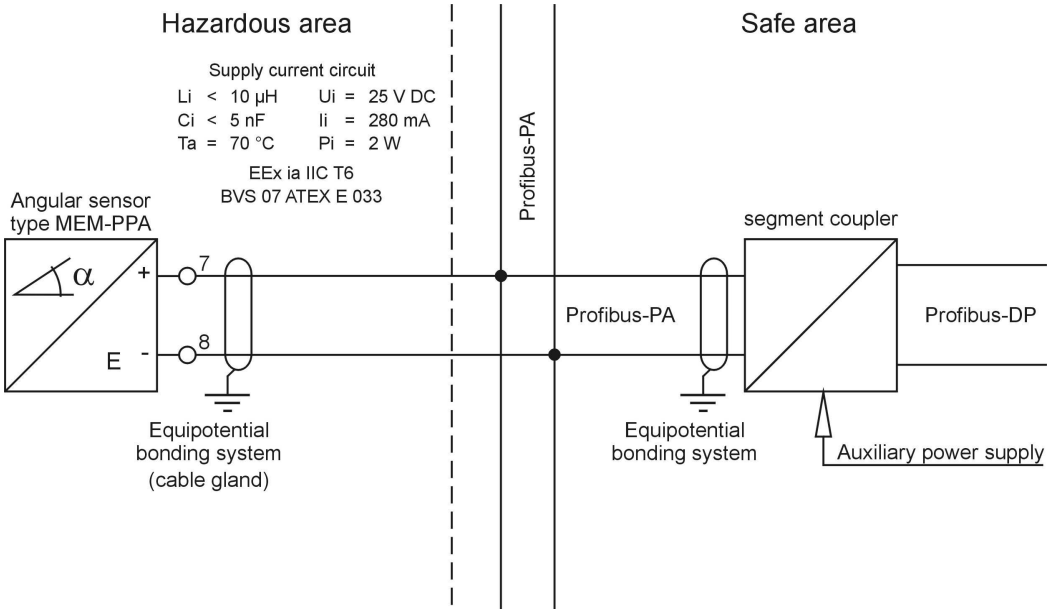


Fig x.x Connection diagram for transducer MEM-PPA with PROFIBUS interface

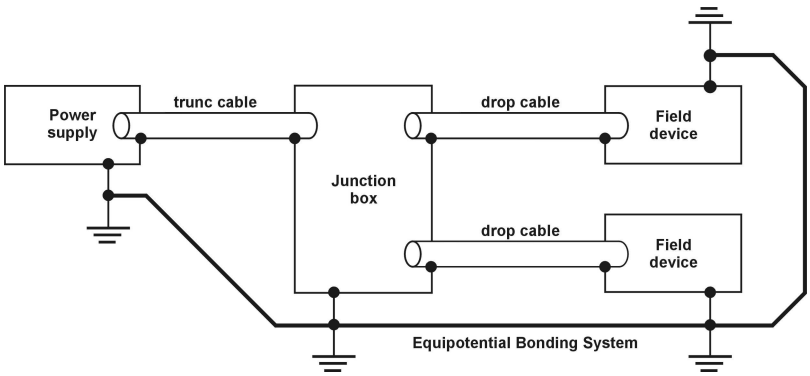


Fig x.x Shielding and equipotential bonding for RE 250 with transducer MEM-PPA

4.3 Protection class

The realised protection class of the display unit made of aluminium is class IP65. The version made of stainless steel will meet all requirements of protection class IP66.

Caution!

After installation and any maintenance work on the device, the operator has to check and ensure the specified protection class again.

Therefor pay regard to the following issues:

- Mounting screws of the display unit must be tightened.
- All gaskets (display unit and cable glands) have to be undamaged. Broken gaskets have to be replaced.
- The electrical cable glands must be free of any damage and tightened. Broken cable glands have to be replaced.
- Install the cables with a loop in front of the cable glands so that moisture does not get inside the display unit (refer to Fig. xx).

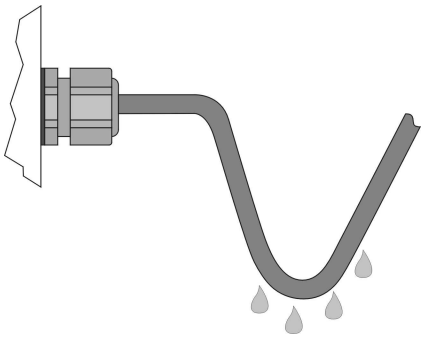


Fig xx Installing the cables in front of the cable glands (loop)

5 Start-up

5.1 Standard device

When starting up the device, the following points must be observed:

- Ensure that the actual operation conditions (pressure, temperature) do not exceed the limits which are given on the nameplate of the device
- Avoid float impacts!
  Therefore it is recommended to start up with a closed shut-off valve and open it slowly. Particularly the use of solenoid valves is not recommended.
- When measuring liquids, the pipes must be vent slowly to prevent shock pressure due to gas bubbles.
- When measuring gases, the pressure must be increased slowly in order to prevent high shock pressure.
- During the start-up of new systems, residual materials are conveyed in the medium and could adhere to the float. In this case we recommend cleaning the instrument after a relatively short period of operation.
- When operating the flowmeter at low flowrates, the device has to start-up with a high flowrate to allow the float to level out. This will ensure measurements within the specified accuracy class.

5.2 Device with current output (MEM)

The magneto-electrical measuring transducer (MEM) is completely factory-set when it is delivered to the customer.

After applying the supply voltage to the device, initially the current output will be about 3.5 mA to 4 mA for a few seconds. After that a current corresponding to the pointer deflection will flow.

Important!
Due to the influence of the float magnet, the MEM transmitter will only output the correct current if the pointer position is caused by the float. Turning the pointer manually will cause incorrect values, but it's suitable for testing the unit.

5.3 Device with PROFIBUS-PA communication

The measured value can be read out shortly after the supply voltage has been applied to the device.

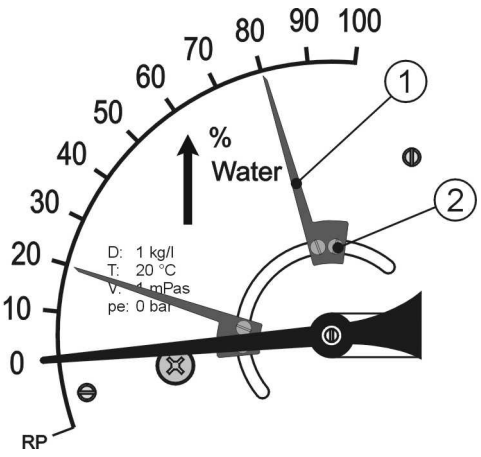
Important!
Due to the influence of the float magnet, the MEM transmitter will only output the correct current if the pointer position is caused by the float. Turning the pointer manually will cause incorrect values, but it's suitable for testing the unit.

5.4 Device with limit switches

The limit switches can be set over the entire measuring range by varying the position the limit pointers.

To set the limit switches at the desired position the following step have to be observed:

- Unloosen the two little fixing screws 2 before moving the pointer 1.
- Move the pointer to the desired position.
- Tighten the screws to fix the pointer.



1 Limit pointer

2 Fixing screw

6 Operation

6.1 Parameter setting using HART protocol

The parameter of the MEM can be set using a hand-held terminal or a PC using a suitable HART®-modem.

The following parameters can be set:

Main menu	Level 2	Level 3	Level 4	Description
Device setup	Process variables	Flow rate		Actual flow rate
		Totalizer		Actual totalizer value
	Diag/service	Test device	Self test	Self test parameters
			Status	Error indication
		Simulation	Default values	Values for simulation
			Start simulation	Start/stop simulation
		Calibration		Calibration parameter
		DA trim		Current output trim
		Reset device		Warm start of device
	Basic setup	TAG		TAG number
		PV unit		Unit of measured value
		Range values	PV LRV	'0'
			PV URV	Upper range value
			PV unit	Unit of measured value
			PV LSL	Lower limit for MR
			PV USL	Upper limit for MR
		Device information	Model	'ES'
			Device ID	Unique device ID
			TAG	TAG number
			Date	Calibration date
			Write protect	'NO'
			Descriptor	Description of device
			Message	Brief message
			Revision #	Revision number
		Xfer function		'Linear'
		PV damp		Time constant
	Detailed setup	Totalizer		Totalizer function on/off
		Low flow cutoff		Cutoff value in %
		Namur	MAX	MAX value in % of URV
			MIN	MIN value in % of URV
			Switch function	N1-N2, MIN-MAX, …
		Switch		Active state open/closed
PV				Measured value
PV AO				Anaolg output (corresp.)
LRV				Lower range value
URV				Upper range value

6.2 Parameter setting using PROFIBUS-PA interface

The parameters of the transducer MEM-PPA with PROFIBUS-PA interface are classified into functional blocks.

The *Physical block* includes information about the device (e.g. Type, manufacturer, etc.), the *Transducer block* contains specific parameters (e.g. calibration factors, zero point value, etc.) and the *Analog input function block* includes parameters for determining the output value (e.g. limit values, measuring range, etc.).

6.2.1 Device address

The device address is used to identify the device uniquely. Devices with identical addresses will cause a collision during bus access. The device address can only be set via bus interface.

The factory set value for the device address is **126**.

6.2.2 Cyclic communication

The bus master can cyclically read out the *OUT value* (32-bit floating point variable in accordance to IEEE-754). The *status* of the device is an 8-bit word and it is defined by the PNO (please refer to chapter 6.2.6).

6.2.3 Physical block

Parameter	Index	Default value (after factory reset)
STATIC REVISION	Slot 1, index 1	0
STRATEGY	Slot 1, index 3	0
ALERT_KEY	Slot 1, index 4	0
TARGET_MODE	Slot 1, index 5	automatic
MODE_BLK	Slot 1, index 6	automatic
ALARM_SUM	Slot 1, index 7	
DESCRIPTOR	Slot 1, index 30	blank
MESSAGE	Slot 1, index 31	blank
DEVICE_INSTALL_DATE	Slot 1, index 32	Blank
DEVICE_CERTIFICATION	Slot 1, index 17	PNO Z00630
TAG	Slot 1, index 2	ES-PPA PHYSICAL BLOCK
Software revision	Slot 1, index 8	1.0 11/00
Hardware revision	Slot 1, index 9	1.0 11/00
Device manufacturer	Slot 1, index 10	108
Device type	Slot 1, index 11	ES-PPA
Serial number	Slot 1, index 12	
Diagnosis	Slot 1, index 13	
Diagnosis screen	Slot 1, index 15	Fixed;0,0,0,0x0B
Factory reset	Slot 1, index 19	
View object	Slot 1, index 33	

6.2.4 Analog input function block

Parameter	Index	Default value (after factory reset)
STATIC REVISION	Slot 2, index 1	0
STRATEGY	Slot 2, index 3	0
ALERT_KEY	Slot 2, index 4	0
TARGET_MODE	Slot 2, index 5	automatic
MODE_BLK	Slot 2, index 6	automatic
ALARM_SUM	Slot 2, index 7	
TAG	Slot 2, index 2	ES-PPA FUNCTION BLOCK
OUT	Slot 2, index 10	
PV Scale	Slot 2, index 11	{100 % = URV; 0 % = 0 (LRV); m3/h}
Out scale	Slot 2, index 12	{100 % = URV; 0 % = 0 (LRV); m3/h}
Channel	Slot 2, index 14	Internal parameter
Time constant	Slot 2, index 16	3 seconds
HI-HI-LIM	Slot 2, index 21	110% of calib. URV
HI-LIM	Slot 2, index 23	90%
LO-LIM	Slot 2, index 25	8%
LO-LO-LIM	Slot 2, index 27	0%
HI-HI-ALM	Slot 2, index 30	110% of calib. URV
HI-ALM	Slot 2, index 31	110% of calib. URV
LO-ALM	Slot 2, index 32	
LO-LO-ALM	Slot 2, index 33	
Simulation	Slot 2, index 33	0.0 / simulation: off
View object	Slot 2, index 40	

Information
*The output value **OUT** is calculated from the **measured value** (see transducer block) in the following way:*

$$OUT = \left(\frac{mesured\ value - PV\,Scale_{0\%}}{PV\,Scale_{100\%} - PV\,Scale_{0\%}} \right) \cdot \left(Out\,Scale_{100\%} - Out\,Scale_{0\%} \right) + Out\,Scale_{0\%}$$

Information
*The **time constant** is used for damping the measured value (flow rate).*

Information!
*The values for **HI-LIM / LO-LIM** define warning levels and the parameters **HI-HI-LIM / LO-LO-LIM** are alarm levels. When theses limits will be exceeded the corresponding outputs **HI-ALM / LO-ALM and HI-HI-ALM / LO-LO-ALM** will be set.*

6.2.5 Transducer block

Parameter	Index	Default value (after factory reset)
STATIC REVISION	Slot 3, index 1	0
STRATEGY	Slot 3, index 3	0
ALERT_KEY	Slot 3, index 4	0
TARGET_MODE	Slot 3, index 5	automatic
MODE_BLK	Slot 3, index 6	automatic
ALARM_SUM	Slot 3, index 7	
TAG	Slot 3, index 2	ES-PPA TRANSDUCER BLOCK
Measured value	Slot 3, index 8	
Nominal size	Slot 3, index 9	factory set value (Unit: inch)
Filter type	Slot 3, index 10	medium (fixed)
Device mode	Slot 3, index 11	Unidirectional (fixed)
Unit of measured value	Slot 3, index 12	m3/h
Self-test	Slot 3, index 13	off
Calibration factor	Slot 3, index 14	1.0
Zero point	Slot 3, index 15	0.0
Direction of flow	Slot 3, index 16	Positive
Upper sensor limit	Slot 3, index 17	110% of calib. URV
Lower sensor limit	Slot 3, index 18	0
Low-flow volume	Slot 3, index 21	0% of calib. URV
View object	Slot 3, index 33	

Information
*The **measured value** (flow rate) can be retrieved from the transducer block non-cyclically and it is calculated in the following way:*

Measured value =** (uncorr. flow rate – **Zero point**) · **Calibration factor

Information!
*The **upper sensor limit** / **lower sensor limit** define the valid operating range for the flowmeter. If the flow rate is out of this range an alarm will occur.*

6.2.6 Status word

The structure and the reading of the status word is defined by PROFIBUS User organization (PNO):

Hex	Status	Measured value	
		Quality	Value
0x8A	Exceeding HI-LIM	Good	Exceeding warning value
0x89	Falling below LO-LIM	Good	Falling below warning value
0x8E	Exceeding HI-HI-LIM	Good	Exceeding alarm value
0x8D	Falling below LO-LO-LIM	Good	Exceeding alarm value
0x52	Exceeding upper sensor limit	Uncertain	Exceeding limit value
0x51	Falling below lower sensor limit	Uncertain	Falling below limit value

6.2.7 Factory reset

After running the *factory reset* command several parameters will be reset to their default values.

For details please refer to the table for the respective functional block.

Information
The device address will be reset to 126.

7 Service

7.1 Maintenance

The devices were built within the scope of low maintenance but periodically the flow-meters should be inspected for signs of corrosion, mechanical wear as well as damage to the fitting and the display unit.

We advice to carry out inspections at least once a year.

For a detailed inspection and cleaning the device must be removed from the piping.

***Caution**!*

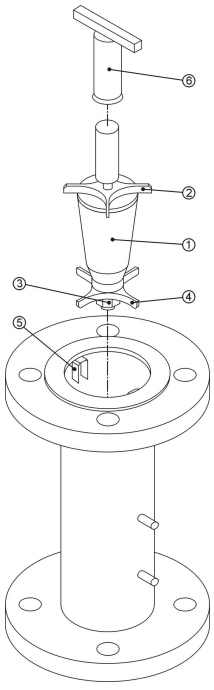
Appropriate safety precautions have to be taken when removing the device. Always use new gaskets when reinstalling the device in the piping.

7.2 Replacing float damping

Devices with measuring ring

For devices with standard measuring ranges starting from 5-50 l/h (xxxx) the float damping can be replaced by the customer:

- Remove the device from the piping.
- Fix the device, ensuring that the fitting will not be damaged.
- The damping cylinder ⑥ is fixed by retaining clamps ⑤. Bend up these two clamps carefully using a suitable tool.
- Move the damping cylinder a little bit to the bottom end of the fitting, make a quarter turn and take the cylinder out of the fitting.
- Insert the new damping cylinder into the fitting from the top, slide it over the damping part of the float and arrange it into the retaining clamps.
- Fix the cylinder by bending the retaining clamps together.
- Fit the device back into the piping.

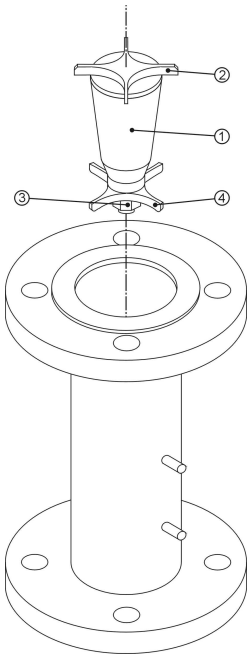


1 Float with damping
2 Upper guide bracket
3 Self-locking nut
4 Lower guide bracket
5 Retaining clamp
6 Damping cylinder

7.3 Replacing floats

Devices with measuring ring

For devices with standard measuring ranges starting from 5-50 l/h (xxxx) the replacement of the float can be provided by the customer:



1 Float
2 Upper guide bracket
3 Self-locking nut
4 Lower guide bracket

- Remove the device from the piping.
- Fix the device ideally in a horizontal position, ensuring that the fitting will not be damaged.
- Prevent the float ① from torsion by fixing the upper guide bracket ② using a suitable tool.
- Remove the self-locking ③ nut which fix the lower guide bracket ④ and take the guide bracket out of the fitting.
- Take the float out of the measuring unit upwards.
- Insert the new float into the fitting from the top. While doing so put the bottom end of the float through the measuring ring carefully.
- Slip the lower guide bracket through the tread at the bottom end of the float and fix it with the self-locking nut.
- Fit the device back into the piping.

Important!

Avoid damaging both float and measuring ring.

Devices with cone

- Replacing floats for devices with cone (standard measuring ranges up to 5-50 l/h (xxx) cannot be provided by the customer. For this purpose the device has to be returned to the manufacturer. For details please refer to chapter "7.6 Returning the device to the manufacturer".

7.4 Returning the device to the manufacturer

This device has been carefully manufactured and tested. Should you nevertheless need to return a device to MECON GmbH please observe the following points:

***Caution**!*

According to the actual waste disposal directives, the owner/customer is responsible for the waste management of hazardous and toxic waste.

For reasons of environmental protection and safeguarding the health and safety of our personnel ***all devices sent to MECON GmbH to be repaired must be free of toxic and hazardous substances. This also applies to cavities of the devices. If necessary the customer is kindly requested to neutralize or rinse the devices before returning to MECON.***

The customer has to confirm this by filling in an appropriate form which is available for download on the MECON website:

www.mecon.de/en/declaration/contamination.pdf

***Caution**!*

In the case of returning devices, despite these requirements, which contain hazardous and toxic substances, Mecon GmbH is entitled to dispose these substances at the cost of the customer without any further inquiries.

7.7 Disposal

***Caution**!*

Disposal of the devices has to be carried out in accordance with relevant legislation in your country.

8 Technical data

8.1 Operating principle

Like other devices of this series the variable area flowmeter *RE250* operates on the principle of flotation:

The measuring unit consists of a metal tube with a measuring ring in which a float can move up and down. The media is flowing upwards through the tube and raises the conical float. Here the annular gap enlarges until the equilibrium between the buoyancy force F_A, the drag force F_S and the weight of the float F_G has been reached. The adjusted height of the float is directly proportional to the flowrate. The movement of the float is transmitted via a magnet to a subsequent magnet in the display unit outside the measuring pipe.

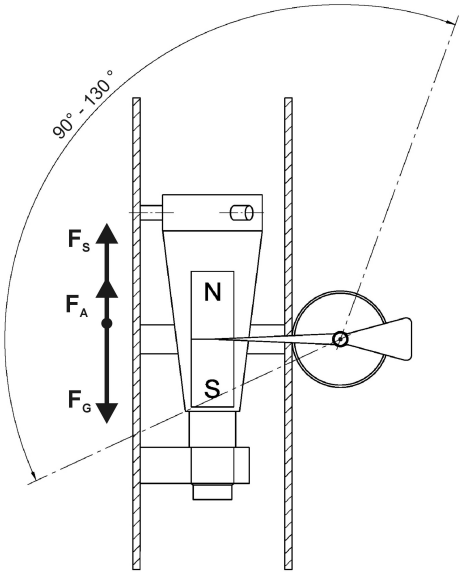


Fig. xx Operating principle of the RE250

8.2 Technical data

General data

Range of application	Flow measurement of liquids and gases
Measuring principle	Flotation / Float measuring
Orientation	Vertical – flow direction from bottom to top

Measuring accuracy*

Directive	VDI / VDE 3513, sheet 2 (qG = 50%)
Liquids	G 1.6 (add. 0,2 % of URV for MEM/MEM-PPA)
Gases	G 2.0 (add. 0,2 % of URV for MEM/MEM-PPA)
Reproducibility	0,5 % of URV

* A variation of the operating temperature to the considered temperature for the calibration process, will lead to a corresponding inherent error.

Materials

		Type CF-S	***Type EF-H***	***Type FF-P***
Wetted parts		**Stainless steel**	**Hastelloy®**	**PTFE**
Flange	*<= DN25 (1")*	Stainless steel	Hastelloy®	Stainless steel
	> DN25 (1")		Hastelloy® stainless	
Fitting	*<= DN25 (1")*	Stainless steel	Hastelloy®	Stainless steel with PTFE liner
	> DN25 (1")		Hastelloy® stainless	
Float + Guide bracket		Stainless steel	Hastelloy®	PTFE
Display unit		Aluminium (optional stainless steel) with safety glass pane		

Operating conditions –all devices

Temperature				
		Type CF-S	***Type EF-H***	***Type FF-P***
Max. Medium temp. TS		-40 °C …+200 °C (opt. -80 °C …+350 °C)		-20 °C …+125 °C
Pressure				
		Type CF-S	***Type EF-H***	***Type FF-P***
Max. Medium pressure PS	*DN 15 – DN 150:*	PN 160 (optional up to 400 bar)		PN 16
	½" – 6":	580 psi (optional up to 5800 psi)		232 psi
Min. operating pressure		> 2 x pressure loss (see measuring ranges)		
Climate classification		Weatherproof and/or non heated locations Class C in accordance with DIN IEC 654 Section 1		

Temperatures

Device version	Ambient temperature*		Storage temperature	
	[°C]	[°F]	[°C]	[°F]
without electrical components	-40 …+80	-40…+176	-40 …+80	-40…+176
with limit switch(es)	-40 …+65	-40…+149	-40 …+65	-40…+149
with 4…20 mA output	-40 …+70	-40…+158	-40 …+70	-40…+158
with 4…20 mA + HART® protocol	-40 …+70	-40…+158	-40 …+70	-40…+158
with 4…20 mA + HART®+ binary outputs	-40 …+70	-40…+158	-40 …+70	-40…+158
with PROFIBUS PA interface	-40 …+70	-40…+158	-40 …+70	-40…+158

*** *IMPORTANT!***
For applications in hazardous areas it is mandatory that the temperature class of the type examination certificate (protection type) will be regarded additionally.

RE250 with limit switch(es)

Cable gland		M20 x1.5
Isolation (2 contacts)		Galvanic isolated
Terminal connection		2.5 mm²
Limit switch		SJ3.5-N-BU
Switching function		NAMUR, NC
Nominal voltage U_O		8.2 V DC (R_i approx. 1 kΩ)
Supply voltage		5 … 25 V DC
Applications in hazardous areas (Type 1)		
Maximum values	Ui	16 V DC
	Ii	25 mA
	Pi	34 mW
	Li	250 µH
	Ci	50 nF
EC Examination (94/9/EC)		PTB 99 ATEX 2219 X
Protection type		II2G Ex ia IIC T6-T4

RE250 with current output 4 … 20 mA

Cable gland		M20 x1.5
Terminal connection		2.5 mm²
Auxiliary supply voltage U_B		14 V … 30 V DC
Measuring signal		4 … 20 mA = 0 … 100% flow value in 2-wire technology
Power supply influence		< 0.1 %
Max. external load R_B		680 Ω (30 V) $R_B = (U_B - 14V) / 22 mA$
Accuracy		0.2 % of URV
Temperature influence		< 10 µA / K
Applications in hazardous areas		
Maximum values	Ui	30 V DC
	Ii	150 mA
	Pi	1000 mW
	Li	240 µH
	Ci	16 nF
EC Examination (94/9/EC)		BVS 07 ATEX E 033
Protection type		II2G EEx ia IIC T6

RE250 with current output 4 … 20 mA and HART® protocol

Supplements to technical data for RE250 with current output 4 …20 mA:

Min. power supply	19.5V DC
HART protocol revision	5.0
Device revision	1
Min. external load	250 Ω

RE250 with current output 4 … 20 mA, HART® protocol and binary outputs

Supplements to technical data for RE250 with current output 4 …20 mA:

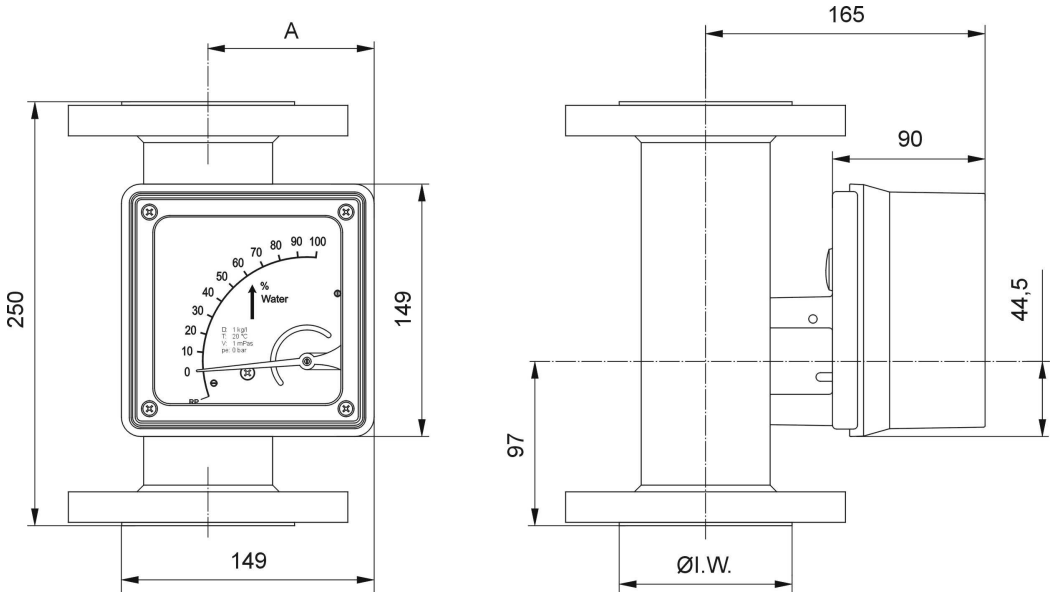
Min. power supply		19.5V DC
HART protocol revision		5.0
Device revision		1
Min. external load		250 Ω
Applications in hazardous areas		
Maximum values	Ui	30 V DC
	Ii	20 mA
	Pi	100 mW
	Li	4 µH
	Ci	16 nF

RE250 with PROFIBUS PA interface

Cable gland		M20 x1.5
Terminal connection		2.5 mm²
Auxiliary supply voltage		10 V … 25 V DC
Operating current		max. 16.5 mA
Fault current		max. 18 mA
Measuring signal		PROFIBUS protocol
Transmission rate		31.25 kBaud
Power supply influence		< 0.1%
Temperature influence		< 0.05 % / K
Applications in hazardous areas		
Maximum values	Ui	25 V DC
	Ii	280 mA
	Pi	2 W
	Li	< 10 µH
	Ci	< 5 nF
EC Examination (94/9/EC)		BVS 07 ATEX E 033
Protection type		II2G EEx ia IIC T6

8.3 Dimensions and weights

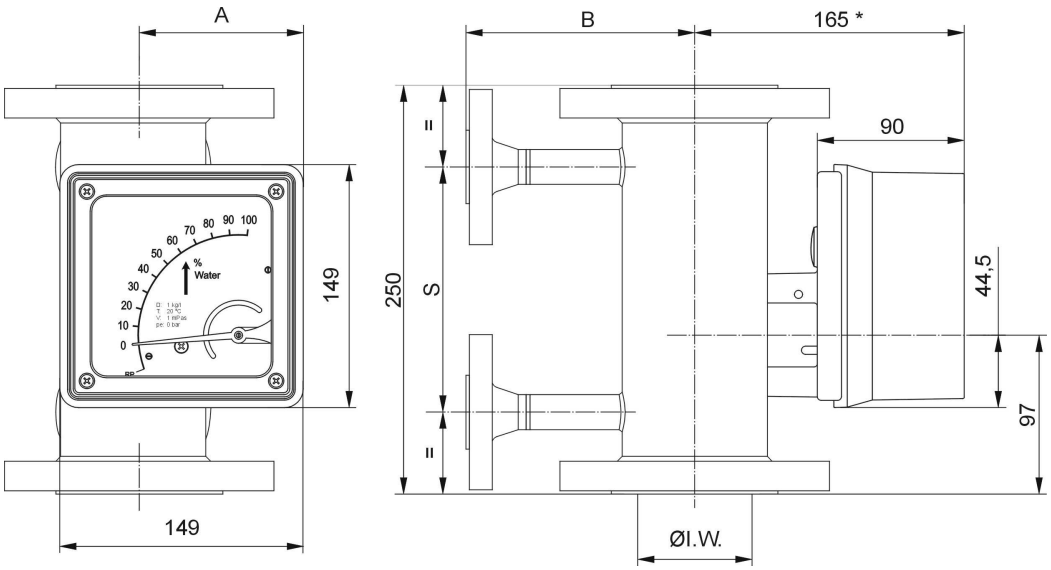
Standard version (Housing of Display made of aluminium)



DN	ANSI	Ø I.W.	A	Weight
15	½"	26 (1,02)	74 (2,91)	3,0 (6,6)
20	¾"	26 (1,02)	74 (2,91)	3,0 (6,6)
25	1"	32 (1,26)	77 (3,03)	4,2 (9,3)
32	1 ¼"	32 (1,26)	77 (3,03)	5,2 (11,5)
40	1 ½"	46 (1,81)	88 (3,46)	6,0 (13,2)
50	2"	70 (2,76)	97 (3,82)	7,5 (16,5)
65	2 ½"	70 (2,76)	97 (3,82)	8,5 (18,7)
80	3"	102 (4,02)	113 (4,45)	13,0 (28,7)
100	4"	125 (4,92)	126 (4,96)	18,0 (39,7)
125	5"			

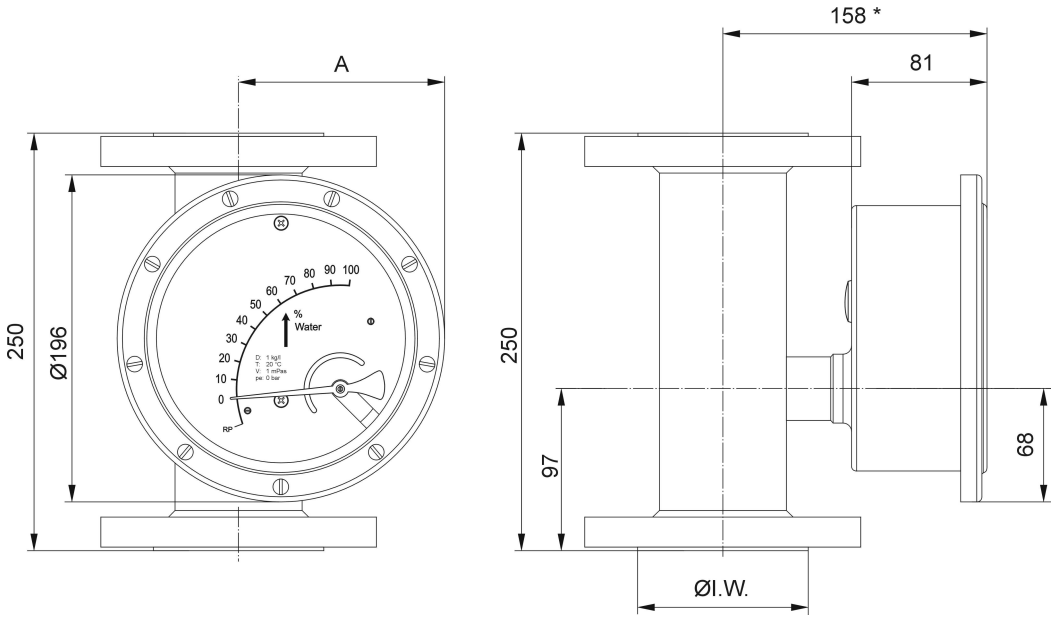
Dimensions in mm (inch)

Heating jacket version



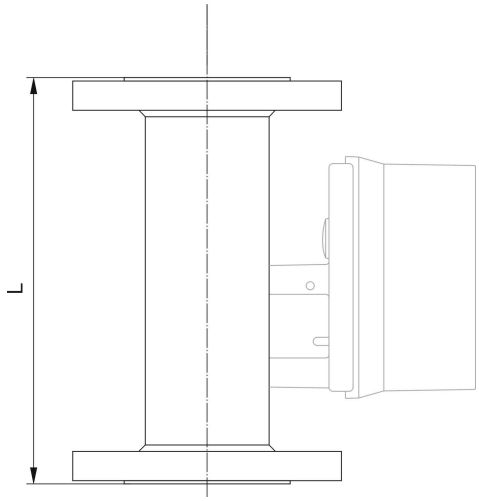
DN	ANSI	Ø I.W.	A	B flange	B Ermeto	S	Weight
15	½"	26 (1,02)	74 (2,91)	110 (4,33)	53,0 (2,09)	150 (5,91)	3,0 (6,6)
20	¾"	26 (1,02)	74 (2,91)	110 (4,33)	53,0 (2,09)	150 (5,91)	3,0 (6,6)
25	1"	32 (1,26)	77 (3,03)	110 (4,33)	58,5 (2,30)	150 (5,91)	4,2 (9,3)
32	1 ¼"	32 (1,26)	77 (3,03)	110 (4,33)	58,5 (2,30)	150 (5,91)	5,2 (11,5)
40	1 ½"	46 (1,81)	88 (3,46)	130 (5,12)	63,0 (2,48)	150 (5,91)	6,0 (13,2)
50	2"	70 (2,76)	97 (3,82)	140 (5,51)	77,5 (3,05)	150 (5,91)	7,5 (16,5)
65	2 ½"	70 (2,76)	97 (3,82)	140 (5,51)	77,5 (3,05)	150 (5,91)	8,5 (18,7)
80	3"	102 (4,02)	113 (4,45)	160 (6,30)	93,5 (3,68)	150 (5,91)	13,0 (28,7)
100	4"	125 (4,92)	126 (4,96)	175 (6,89)	110,0 (4,33)	120 (4,72)	18,0 (39,7)
125	5"						

Stainless steel version



DN	ANSI	Ø I.W.	A	Weight
15	½"	26 (1,02)	103 (4,06)	3,0 (6,6)
20	¾"	26 (1,02)	103 (4,06)	3,0 (6,6)
25	1"	32 (1,26)	105 (4,13)	4,2 (9,3)
32	1 ¼"	32 (1,26)	105 (4,13)	5,2 (11,5)
40	1 ½"	46 (1,81)	115 (4,53)	6,0 (13,2)
50	2"	70 (2,76)	129 (5,08)	7,5 (16,5)
65	2 ½"	70 (2,76)	129 (5,08)	8,5 (18,7)
80	3"	102 (4,02)	145 (5,71)	13,0 (28,7)
100	4"	125 (4,92)	158 (6,22)	18,0 (39,7)
125	5"			

Mounting dimension L



Nom. Dia.		EN			ANSI		
		PN 16	PN 40	PN 100	150 lbs	300 lbs	600 lbs
DN 15	½″		250	250	250	250	250
DN 20	¾″		250	250	250	250	250
DN 25	1″		250	250	250	250	250
DN 32	1 ¼″		250	250	250	250	250
DN 40	1 ½″		250		250	250	250
DN 50	2″		250		250	250	300
DN 65	2 ½″	250	250		250	300	300
DN 80	3″	250	250		250	300	300
DN 100	4″	250	250		250	300	300
DN 125	5″	250	250		250	300	300
DN 150	6″	250	300		250	300	